PROJECT NUMBER: 6502
PROJECT TITLE: Environmental Tobacco Smoke
PROJECT LEADER: C. E. Thomas
PERIOD COVERED: April, 1989

I. MAINSTREAM AND SIDESTREAM SMOKE STUDIES

A. **Objective**: Determine if the methanol measured in an unlit puff of a production marlboro is due to solvents in pack materials.

B. **Results**: The tunable diode laser spectroscopy system was used to evaluate the levels of methanol in unlit puffs from Marlboro 85mm and 80mm cigarettes (manufactured at MC, March, 1988). There were no differences in unlit puff methanol of cigarettes, which had been analysed directly from the pack, with cigarettes that had been collected loose at the makers.

C. **Conclusions**: In the samples that were investigated, methanol in the unlit puff and in MS smoke is not originating from solvents used in packaging materials

D. **Plans**: Samples will be heated in a 55°C oven for 24 hours to determine if free methanol may increase due to reactions taking place within the tobacco or flavoring systems. The Marlboros studied initially will be evaluated for changes in the free menthanol as a function of cigarette age.

E. **References**:

1. Lipscomb, J., Notebook 8703, pp. 78, 83.

2. Parrish, M. Notebook #8729, pp. 33-44.

II. PROJECT ART

A. **Objective**: Evaluate the effect of addition of selected acids on the ammonia delivery of ART cigarettes.

B. **Results**: Machine-made ART cigarettes (D9TC-1) were used in several studies in which either citric or lactic acids were injected on the filler or filters. These additions resulted in reductions in MS ammonia deliveries with the highest reductions observed when the acids were placed on the filters.

C. **Conclusions**: The addition of citric and lactic acids reduce the ammonia deliveries of ART cigarettes. In one specific experiment, a 55% reduction was observed in the MS gaseous ammonia when 2 mg of citric acid was added to the cigarette filter.

D. **Plans**: The experiments will be repeated using 5 mg each of malic, citric, and lactic acid on the filters of the ART cigarettes. Additional MS total ammonia determinations and TPM fractionation data will be used to study changes in the basicity of the MS smoke.

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E. **References**:

1. Parrish, M., "Summary of Results and Recommendations for the Reduction of MS Ammonia in Art Cigarettes", Memo to J. Charles, April 12, 1989.
2. Parrish, M., White, G., "Reduction of Total Ammonia MS Delivery in ART Cigarettes Treated With Lactic Acid", Memo to C. Kroustalis, April 12, 1989.
3. Parrish, M., PM Notebook 8729, pp. 28-29.

III. ETS STUDIES

A. **Objective**: Provide analytical support to project PACT by measuring the various constituents of environmental tobacco smoke.

B. **Results**: In Phase I of the studies being conducted by project PACT, ventilation, Electrostatic Precipitation (ESP), and selected carbon filters have been evaluated for the removal of particulates and nicotine. Currently sixteen different experiments have been completed. For each experiment six PASS cases are used to measure the total particulates (RSP), nicotine, CO, temperature and barometric pressure. Additional instrumentation is employed to measure the distributions in the test room (175 m^3) of particulates, CO, CO_2, temperature, and relative humidity. In a control experiment, the RSP was 1.8 mg/m^3, CO was 13 ppm, and the nicotine was 0.56 mg/m^3 when ventilation (3.5 air exchanges per hour) was the sole source for smoke removal. When an ESP unit was added with an additional recirculated volume of air of 17.5 m^3/minute, these values were reduced to 0.64-mg/m^3 RSP, 0.47 mg/m^3 nicotine, and 11 ppm CO.

C. **Conclusions**: The ESP unit has been shown to remove particulates from room air as well as providing some reduction in the room nicotine concentrations. The limiting factor in the reduction of smoke particulates is the effective ventilation rate in air exchanges per hour of the ESP unit.

D. **Plans**: This project will continue to provide analytical support for project PACT. Additional tests will be conducted to study the removal efficiency of different ESP units for particulates. In Phase II of this study methods will be developed to study the reduction of gas phase components of cigarette smoke.

E. **References**:

1. Lipscomb, J., Notebook #8703, pp. 88-90.

2. White, G., Notebook #8688, p. 43.

3. Koller, K. Notebook #8700, p. 70

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